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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

DECEMBER 5, 2001

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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488th MEETING

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

MORNING SESSION

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WEDNESDAY

DECEMBER 5, 2001

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ROCKVILLE, MARYLAND

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The Advisory Committee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pike, at 8:30 a.m., Dr. George E. Apostolakis, Chairman, presiding.

COMMITTEE MEMBERS:

GEORGE E. APOSTOLAKIS	Chairman
MARIO V. BONACA	Vice Chairman
F. PETER FORD	Member
THOMAS S. KRESS	Member-at-Large
DANA A. POWERS	Member
STEPHEN L. ROSEN	Member
WILLIAM J. SHACK	Member

COMMITTEE MEMBERS:

JOHN D. SIEBER	Member
ROBERT E. UHRIG	Member
GRAHAM B. WALLIS	Member

ACRS STAFF PRESENT:

JOHN T. LARKINS

PAUL A. BOEHNERT

SAM DURAISWAMY

CAROL A. HARRIS

HOWARD J. LARSON

I-N-D-E-X

P-R-O-C-E-E-D-I-N-G-S

(8:30 a.m.)

DR. APOSTOLAKIS: The meeting will now come to order. This is the first day of the 488th Meeting of the Advisory Committee on Reactor Safeguards. During today's meeting, the Committee will consider the following: Dresden and Quad Cities core power uprate, discussion of topics for meeting with the NRC commissioners, risk-informed 10 CFR Part 50 Pilot Program, Option 2, and proposed ACRS reports.

A portion of this meeting will be closed to discuss General Electric nuclear energy proprietary information applicable to Dresden and Quad Cities core power uprate.

In addition, the Committee will meet with the NRC commissioners to discuss matters of mutual interest. This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act. Dr. John T. Larkins is a designated federal official for the initial portion of the meeting.

We have received no written comments or requests for time to make oral statements from members of the public regarding today's sessions. A transcript of portions of the meeting is being kept,

and it is requested that the speakers use one of the microphones, identify themselves, and speak with sufficient clarity and volume so that they can be readily heard.

I bring the members' attention to the items of interest handout, which contains four speeches by the commissioners, two on nuclear security issues by Chairman Meserve, one on the future of radiation protection by Commissioner Dicus and one by Commissioner Diaz on predictability and balance.

Our first item is the Dresden and Quad Cities core power uprate, and Dr. Wallis will lead us through this.

DR. BERG: Mr. Chairman, I think Dr. Ford would like to make a comment first.

DR. APOSTOLAKIS: Dr. Ford.

DR. FORD: Since I have a --

DR. APOSTOLAKIS: Microphone.

DR. FORD: Since I'm a GE retiree, I have a conflict of interest on this topic.

DR. APOSTOLAKIS: So noted.

DR. WALLIS: Well, the Committee will remember that we discussed this matter at our last meeting, and the Committee had a few questions that remained unanswered. And we also wanted to hear the

resolution of the outstanding issue regarding large-scale tests. And we hope to be satisfied with what we hear today regarding those matters. So I think we're going to start with the staff, then we'll move on to Exelon.

MR. MARSH: Good morning. My name is Tad Marsh, and I'm the Deputy Director of the Division of Licensing Project Management at NRR. We're here today to brief you on the open item on the draft safety evaluation, the extended power uprate for Dresden and Quad Cities. The issue specifically before us is the large transient tests and the recirc runback test. These items were discussed with you previously at the last full Committee meeting, and we have reached resolution on them.

Specifically, the issue was a proposal by the Licensee to not conduct the generator load reject test and the main steam isolation valve closure test as described in ELTR1. In addition, per your request, we are also here to discuss with the recirc runback test.

Now, if you recall, during the last meeting, we had indicated that we were not able to discuss these open items with you, because it was still being evaluated by the NRR staff and by senior

management. This decision that we were pondering at that point we have now made, and it was a significant decision with both pros and cons. And we wanted to make sure that we had a solid basis for our conclusion.

We've completed our evaluation of the Licensee's proposal to not conduct the large transient tests, and we've concluded that it is an acceptable proposal. Our conclusion is based on the scope and the extent of the modifications that are being made to support the power uprate, the numerous tests that the Licensee is proposing to perform at the system and component level, evaluations of the systems and components that are important to the tests under consideration and the safety benefit, or lack thereof, from these large transient tests.

I'd like to emphasize that the decision that we're making is associated only with Dresden and Quad Cities. It's not a generic decision that we're making. We will be considering other power uprate applications on a case-by-case basis with respect to these tests.

DR. POWERS: Tad, are you laying out something so that an applicant can reasonable anticipate what he should have to do in order to avoid

having to do the integral tests or is it really a case by case sort of thing?

MR. MARSH: Dr. Powers, I think the safety evaluation lays out the staff's considerations for both the pros and for the cons, and I believe the Licensee, in reading the safety evaluation, will see the elements that we used in coming to that conclusion so that they would know how to apply or what to do.

DR. POWERS: I guess maybe licensees are more prescient than I am, because I think I would have a hard time saying, "Okay, if I do this, this and this, I have high confidence that I will not have to do this test." I think I'd have a hard time doing that.

MR. MARSH: Okay. Let's go through the presentation. You hear the considerations, and I believe you'll hear a lot of the elements that we did that we evaluated that I think would guide licensees. You're going to hear agreement, to a large extent, with the specific proposals that were made. And you're going to hear what these tests do and don't do, okay? So to that extent, the plant-specific evaluation may be broader than just this particular Plant; it may be. But we wanted to leave ourselves some room in case systems, structures, components,

trips were added to the Plant, which would guide us in another way.

We've also evaluated the Licensee's proposal to not conduct the recirc runback test, and we'll be discussing that with you today.

Let me now introduce the presenters. Mohammed Shuaibi on my far right will be -- he was the Lead Project Manager for Power Uprate -- will be talking about the tests, the large transient tests. Also, Stew Bailey, who is to my immediate right here, who is the Project Manager for Quad Cities, will be presenting the staff's evaluation for the recirc runback tests.

If no further questions, we'll start with the presentation. Mohammed?

MR. SHUAIBI: Good morning. My name is Mohammed Shuaibi, and I'm going to cover the large transient testing, as Tad said. The tests under consideration are those included in ELTR1. These are the load rejection tests and the MSIV closure test. As you know, the load rejection test is included in ELTR1 for power uprates greater than 15 percent. The MSIV closure test is included for power uprates greater than ten percent.

As I'm sure you're aware, the Licensee

referenced ELTR1 in their application; however, they proposed to not do these tests, which are included in ELTR1. So, in effect, what we have is a proposed deviation from an approved topical report.

The Licensee provided a justification for this deviation. Since the Licensee covered its justification in detail during the last few meetings with the ACRS, I'm only going to summarize what they said. First, the power uprate is being achieved while maintaining a constant steam dome pressure. This is called the constant pressure power uprate -- I'm sure you've heard that term before. Because the steam dome pressure is not changing, the effect of the power uprate on the Plant is significantly reduced. This also led GE to conclude that these tests are not necessary for constant pressure power uprates.

DR. POWERS: When GE put together ELT whatever 1, they thought they were necessary.

MR. SHUAIBI: That's true.

DR. POWERS: What caused them to change their mind?

MR. SHUAIBI: Basically, ELTR1 covers different ways that you could achieve the power uprate.

DR. POWERS: That's right.

MR. SHUAIBI: It allows plants to increase pressure. It's not limited to constant pressure power uprates. Also, at the time -- this was back in 1995 and 1996. At that time, they had no experience with these major power uprates. And I'm not here to tell you that they have significant experience now --

DR. POWERS: They don't have much experience now either.

MR. SHUAIBI: Right. But they do have a couple of data points.

DR. POWERS: Which --

MR. SHUAIBI: Which I'll be covering a little bit later in terms of how we evaluated that. That's not the basis for our conclusion.

DR. POWERS: You mean GE just said, "Gee, we were wrong, we don't need these things anymore"?

MR. SHUAIBI: I think they looked at the effects of the power uprate, of a constant pressure power uprates on the Plant. And, basically, they were convinced that they were able to model the Plant without having to do these tests for confirmation. They were convinced that they can do that.

MR. MARSH: I want to point out there's also a proposal before the staff, a modification to the licensing topical report to not do these tests,

which is under staff consideration too. So I believe their thinking has evolved --

DR. POWERS: What I'm trying to understand is why their thinking evolved. I mean somebody said, "Gee, GE, this costs us a fortune to do these tests. Change your mind"?

MR. SHUAIBI: I guess, maybe if I could go through our presentation, we could tell you why we came to our conclusion.

DR. POWERS: Right now I'm trying to understand -- I mean if we don't understand why GE changed its mind, just say so.

MR. SHUAIBI: We have asked several times GE for why it was proposed and what changed that would -- you know, what changed since then. And, basically, it is that it is a constant pressure power uprate and that the effect of the constant pressure power uprate is not that significant on the Plant. I believe GE is here, and they want to talk to this.

MR. KLAPPROTH: Yes. This is Jim Klappworth from GE. Let me just reiterate, I think, Mohammed's statements. I think that's exactly the situation we're in. When we first came in with the ELTR, that approach allowed a pressure increase or no pressure increase, and at the time we did not have a

lot of experience with the extended power uprates, so we proposed the large transient testing at that point in time. Since that time, we have evolved in our power uprate process and evolved to the CPPU, the constant pressure power uprate process.

In addition, there's been several plants that have done testing -- KKM, KKL -- and we have some transient test results from Hatch. So we have some actual plant data that we've been able to actually model after the fact and also predict before the tests are run. So we have high confidence that there is no need to do the large transient testing. We don't really gain that much from these testings under a constant pressure power uprate scenario.

DR. POWERS: What was the rationale for having the proposal -- I mean when -- I can never remember the acronym -- ELTR1 came in, it considered both pressure increases and no pressure increases, but the testing was for both. And there must have been some reason for lacking the confidence.

MR. KLAPPROTH: Again, at that time, we had no direct experimental test results or predictions at that point in time. We had just started the extended power uprates. And we did not differentiate in the ELTR1 between a no pressure and a pressure

increase power uprate.

DR. POWERS: Trust me, I know that's true. A mystery.

MR. SHUAIBI: Well, maybe -- again, maybe we could cover what we evaluated when we through the Licensee's proposal, and maybe that will explain, at least, how we came up with our conclusion for Quad Cities and Dresden again. We'll be evaluating this on a case-by-case basis for the other plants.

Okay. Moving on, the Licensee also stated that these tests will not provide new information about transient model --

DR. WALLIS: That's a strange conclusion. I mean every time you run a test you might find something happens that you were surprised by. So you can never say that a test will never give you any new information.

MR. SHUAIBI: That is true, Dr. Wallis. I think what I did here is I'm trying to present -- summarize what the Licensee presented, but I totally agree with you. Any time you run a test, you will gain some information, even if it's confirmation that you did things correctly. So there's additional data that gets collected, and that is some new information. And if surprises occur, then, yes, you're right.

DR. WALLIS: Then you'd have to use a different argument, saying that the expected small amount of information to be gained is not worth the risk or some task --

MR. MARSH: We're going to get there. We're going to get there.

MR. SHUAIBI: And that is in our evaluation. I'm just summarizing what was presented to you before.

DR. WALLIS: But if they made statements like that, they're very suspicious statements.

MR. SHUAIBI: Again, once I get to our evaluation, you'll see those statements a little differently.

DR. WALLIS: Okay.

MR. SHUAIBI: Okay. Also, they stated that experience with power uprate shows that GE is able to predict Plant response following power uprate in an acceptable manner, and they provided some information related to that.

DR. WALLIS: That means acceptable prediction of previous similar tests; is that what it means?

MR. SHUAIBI: In some cases, it's previous similar tests; in other cases, although it was not GE

that analyzed the transients, they were plant transients at Plant Hatch in which no significant surprises or no surprises related to power uprates were identified.

In addition, predictions were made for the Dresden and Quad Cities Plants, and the predictions showed that no significant change will result from the power uprate.

And, lastly, the Licensee evaluated components important to the transient tests under consideration, again, the load rejection test and the MSIV closure test, and they concluded that testing is not necessary based on the effect of the power uprate on those components.

And to summarize the Licensee's conclusion, based on its evaluation, the Licensee concluded that no significant information is expected to be gained by performing these tests, and that from a risk and safety perspective, unnecessary Plant transients should not be induced without a commensurate benefit.

DR. WALLIS: They didn't actually make some evaluation of the risk and benefit, did they? They made a qualitative argument.

MR. SHUAIBI: They did provide some risk

information related to performing the task; however, it's, I believe, hard to quantify the benefits of the test. But they did provide risk information -- you know, the risk associated with performing the test. And we looked at that.

Okay. Moving on to our evaluation of what was presented. The staff evaluated the Licensee's request and justification for not doing these tests. First, we considered the scope and extent of modification made to the Plant. We found that the major modifications are basically on the secondary systems, not on safety systems.

Next, we examined the effect of the power uprate on the Plant. Basically, the power uprate will result in an increase in power level, obviously, and decay heat; increase in steam flow and feed flow, I think those numbers were presented as about 20 percent; decrease in pressure and temperature at the turbine inlet, that's a small decrease, I think it's less than five percent; and an increase in loading on some of the electrical equipment.

We then considered the testing that the Licensee is planning to perform. The Licensee's power ascension and test plan includes hold points at 50 percent of the pre-EPU power level, at 75 percent, at

90 percent and at 100 percent. The Licensee will conduct testing and collect data related to steady-state Plant response.

In addition, after reaching 100 percent of the pre-EPU power level, the Licensee will increase power in increments of less than or equal to five percent, as recommended in ELTR. I believe they stated at the last meeting that they'll be doing that in three percent increments.

They will perform additional testing and collect more data at each increment, at each increase in power to ensure that the Plant is behaving the way that they expect it to. What they'll be doing, too, is they'll be projecting new values for some of these parameters for the next increment in power level and making sure that they're able to predict that.

The kind of testing and data collection includes vibration, system equipment performance, feedwater pump run-out, fuel delta P, and these are just examples of the kinds of things that they're going to be doing.

In addition, the Licensee's performing a significant amount of system and component level testing. In addition to post-modification testing, the Licensee is testing systems and equipment whose

performance requirements have changed as a result of the power uprate.

DR. BONACA: I need to ask a question. Are these tests part of start-up testing when the Plants were being built, so they were standard start-up tests?

MR. SHUAIBI: Yes. So are the load rejection tests and MSIV closure tests, though.

DR. BONACA: I mean the question seems to be there should be, on the part of GE, some objectives that they had regionally that they wanted to achieve. And whether or not the power uprate is so significant that it is almost like a new plant that you have to do, because I think if it is almost as a new plant, then you would say you want to have one. If it isn't, understand the reasons why. But I just was wondering again if we could get more insights from GE regarding the original objectives of those tests as part of this sort of testing.

MR. MARSH: Care to comment?

MR. KLAPPROTH: I guess at this point -- this is Jim Klapproth again from GE -- just to reiterate the original thinking at the ELTR stage, and, again, that was back eight, ten years ago, our thinking has evolved, and I guess I really can't

comment any further as to this issue, other than the fact that we have learned, we've been able to model these events, we've been able to predict these events very well.

In fact, back when we were here with the, I guess the Subcommittee in June of this year, we presented the results of the KKM test. I'm not sure if it was KKM or KKL. It was a KKL test, and we showed that we were able to model these events very well. So based on that predictive capability and the additional Hatch test and the fact, again, that the Dresden/Quad Cities power uprate is a zero pressure increase power uprate, we feel there's no need for testing.

DR. BONACA: I understand.

MR. MARSH: Well, from the standpoint of the original purposes of the test, and that is why the staff wants these tests to be done originally, it is as you say. This is part of the start-up testing program. When there is a new plant that's been constructed with new systems, new structures, new components, new electronics, new trips, new integrated operations that you want to verify, it is important to run these tests up to a certain point, which is normally the full power point.

The question is when you increase power by a certain point, does it raise questions about those system structures and components, trip set points to the extent that you need to run an integrated system test? In our judgement, it does not.

And that's the -- we looked at the safety benefit that you would achieve from doing this test, whether there's enough questions that would be raised and answered by this power uprate, and we've come to the conclusion that there is not. There's enough testing that's done reaching going up to the new full power level to flush any types of weaknesses that would occur.

DR. BONACA: I understand. I was asking the question because if in fact we had some memory of what the original objectives were, regarding the very points that you made -- instrumentation --

MR. MARSH: Exactly.

DR. BONACA: -- then one could, you know, pretty well evaluate why a power uprate of 20 percent or 30 percent, or whatever it's going to be, is really necessary, because -- but, I guess, we don't have now a detailed --

MR. MARSH: If the Plant were modifying itself in some fundamental way, that is adding new

trip features, if it were challenging limits in some fundamental way or if there were code prediction questions, such that we were unsure that ODYN's capability to predict how the Plant would perform, I think we'd be at a different place.

DR. BONACA: Okay.

MR. ROSEN: Well, using that exact logic, Tad, I would conclude that the recirc runback test fits that, that you ought to run them, because it's new systems and new equipment. I mean it fits exactly to use that logic. So help me through why even if that logic applies to the large transient test, but if applied to the recirc test, it would seem to lead you to a different conclusion than I anticipate you'll tell us in a minute.

MR. MARSH: Can I leave us to that point to lead us through that logic, rather than diverting at this point?

MR. ROSEN: But just park that thought.

MR. MARSH: Okay.

MR. ROSEN: I mean I think you just made an argument for the recirc runback test.

MR. MARSH: Okay.

MR. SHUAIBI: Okay. We also evaluated the effect of the power uprate on mechanical and

electrical components important to the tests under consideration. We looked at the effect on MSIVs, we looked at the effect on control rod insertion, relief and safety relief valve performance, turbine stop valves, turbine control valves, scram signal timing, turbine bypass systems, main generator, an on-class 1-E switch gear, unit aux transformer, reserve aux transformer. We looked at all that to convince ourselves that in fact these tests are not needed and that the Licensee can justify and that we could accept this proposal.

Based on this evaluation, we concluded that the effects of the power uprate on these components are small. Components are covered by other tests. In cases, for example, of the MSIV, we have tech spec requirements that say that the valve must close no faster than three seconds, no later than five seconds, things like that. Components are covered by other tests, and/or the effects are adequately covered in models used for the analyses. In certain areas where there's no testing, we look to see, well, what do we normally expect in that area? And we found that it's adequately covered in the modeling.

We also considered the need for performing these tests for code validation. We do not need these

tests for code validation. As you know, analytical codes are validated using data from numerous test facilities and operational experience at other BWRs or at BWRs, in general, that bound proposed operation of Dresden and Quad Cities.

We then examined the applicability of the tests to safety analyses. Obviously, these are real Plant transients that would happen. Non-safety related equipment would be there to mitigate these events. Anticipatory trips, which were discussed before, will be there to trip the Plant. And all those reasons together, you know, these tests are going to be much more benign than the actual safety analyses. So although, as Dr. Wallis said before, you would get some information, that information doesn't necessarily confirm that the safety analyses are done correctly. We do those by other means.

We also considered power uprate experience presented by the Licensee. The Licensee presented information related to Hatch, which was uprated to 113 percent of the original rated thermal power, and the KKL Plant, which uprated to 117 percent of original rated thermal power. I'd like to note, and I think we said this before, that we do not consider the experience at Hatch and KKL to be directly applicable

to Dresden and Quad Cities. Obviously, these Plants are not identical and the tests may have been done for different reasons. For example, KKL, I believe, was a scram avoidance test, because they have different runback capabilities.

In addition, this experience alone would not be sufficient to approve the Licensee's request if all that they presented was the Hatch and KKL data. We do not believe that we would be here today telling you that we accept this. However, because of the implementation of similar modifications at those Plants to those that were done at Quad Cities and Dresden, we do believe that to some extent GE's ability to predict the effect of the power uprate on component performance is validated. Again, it wouldn't by itself be sufficient, but we do believe that it's another data point that we could rely on.

To summarize our evaluation, we believe that the combination of system and component evaluation proposed and proposed testing at Quad Cities and Dresden is sufficient to satisfactorily demonstrate successful Plant modification without performing these large transient tests. We believe that the benefits of large transient tests are not sufficient to justify the challenges to the Plant and

its equipment, the potential risk associated with these tests and the burden.

We did not identify any safety concerns that would warrant the performance of these tests. In addition, the Licensee's application meets all regulatory requirements without performing these tests.

So based on our evaluation, we concluded that the value added of these tests at Dresden and Quad Cities is minimal, and therefore we accept the Licensee's proposal to not perform these tests. And, again, I'll reiterate what Tad said earlier: This is for Dresden and Quad Cities. We'll be looking at other plants when they come in, or as we're reviewing them.

And that concludes my presentation on large transient testing. I'll take any questions now.

MR. MARSH: Dr. Powers, you asked a question whether licensees would know what the staff would find acceptable or not in terms --

DR. POWERS: I think I'm still kind of at sea on this, because there's not a number, there's not a quantification. This is a sense sort of thing.

MR. MARSH: Yes. Our safety evaluation has in it a table, and the table talks about the

components, the features of the Plant that are affected by or that would affect the test itself. And it talks about the tests that are already on those structures and components, technical specifications or surveillances or how they're covered by the existing requirements.

That really forms, I think, the guidance to licensees about how we judged structures and equipment and its relevance to these tests. And if plants had changed those structures and systems or if they were not tests, as we described in that table, then they would have to justify deviations from -- or justify not doing a test in that context.

DR. BONACA: Why did you have to develop a table? Why didn't the Licensee have to develop a table referring to the original tests explaining the basis so that you could support it or not? I don't understand. I don't understand. The Licensee comes and says, "We don't want to do the test," and gives some words. And now you are here developing a basis for it in your SER.

MR. MARSH: Right. And is your question why are we doing that?

DR. BONACA: No, I'm saying why shouldn't it be part of the application? I mean I don't have

anything against not running the tests, but there is a lot of information licensees -- that GE developed originally to justify the tests, what the objectives were.

MR. MARSH: Right.

DR. BONACA: And if you take those objectives, you could probably, easily demonstrate that you don't need these tests by doing certain things. Now, we haven't seen that. All I hear is that the SER has a table -- and we haven't seen that either -- that explains these details that Dr. Powers is asking for and other licensees would want to know. It seems like a reversal of roles.

MR. MARSH: Well, the Licensee did provide information that -- you want to answer?

MR. HAEGER: Well, in some sense -- my name's Al Haeger, I'm with Exelon. We did provide a table in our submittal of the analysis of the components and how they're tested and why we believe that that covers the points that were made by the NRC. So we did provide a table to them. Now, we did not specifically talk about the original purpose of these tests. We hadn't thought of that at the time. Since then we have seen some other licensees start to do that. But our submittal did provide a table of the

components and how they're tested and why we believe the effects of EPU were minimal.

MR. SHUAIBI: That was actually provided in response to an RAI, but, yes, they did provide a table. I don't know if it's the same table that you're talking about, but they did provide a table of these components and what effect the power uprate has on these components and their evaluation of the effects and why it's not necessary to do these tests in order to confirm that.

DR. POWERS: And the components in that table do get tested as we make these incremental three --

MR. SHUAIBI: Several ways that things get tested. For example, the MSIVs know they're not going to be --

DR. POWERS: Well, yes, but --

MR. SHUAIBI: Yes. There are several ways that components are getting tested. Some have tech spec requirements, some are -- some data is being taken as they're going up in power. And if you have one in mind, I could probably go through that with you.

MR. MARSH: The table has in it, for example, safety relief valves. Those aren't tested

during this power ascension. The point that's made in the table is that there's no change in set point to the safety relief valves, but there is a change in capacity. We rely on more safety relief valves to open as a result of the increased power. Turbine stop valves, the control valves are in that table. There is some testing of that, but I don't believe it's done in increments on the way up. There's some testing that's described in the table that you would do normally, and it's still contained in the requirements. Can you remember the features that's in the table?

DR. POWERS: I can assure you I do not remember the table.

MR. MARSH: Okay. The point we're trying to convey is staff looked at the safety benefit from these tests and found it was not sufficient safety benefit. I don't want you leave with the impression that there's no benefit to tests. There would be benefit to tests. You'd get information, you could confirm. There are reasons why these tests may be good to do. And what the staff was faced with was trying to make a judgment about the merit, the usefulness of the tests compared to the safety benefit of the tests. And the difficulty in the decision was

there are some good arguments for doing these tests. We had to look carefully at the safety benefit and the impact that you would be -- what you use these tests fundamentally for and how can you come to a conclusion.

So we -- we're conveying to you the basis for making the decision, but I don't want to leave you with the impression that it was all that clear, that we ran to the decision because it was overwhelmingly so. We had to very carefully consider the pros and the cons. And the staff -- there are still members of the staff who think we should be doing these tests. So I don't want to leave you with the impression that --

DR. POWERS: What is their argument?

MR. MARSH: Well, let me give you some of the arguments. First, it's consistent with the topical report. Staff approved the topical report, and GE proposed doing these tests, so that formed an Agency opinion. Okay? Now, we can argue why it was proposed, the bases for it, why we're deviating, but it still formed an Agency opinion. So that's the reason why.

It is a demonstration of integral Plant performance, which from a safety perspective you'd

think that would be a proper direction to go. But from the standpoint of what do you fundamentally challenge in this test, are you fundamentally challenging safety set points, are you challenging safety equipment? You're not.

But you can see your conservative thinking leads you towards we should be doing a test. And then we had to weigh carefully the impact, the benefit, the purpose, what you gain from it. And we came to the conclusion that it was not necessary. But we want to leave ourselves the thought that if something does change, if there's a system or a structure or if there's a code issue, we may have to.

DR. KRESS: In making this judgment, did you run the analysis through the standard back fit regulatory analysis? Is that the kind of judgment you made?

MR. MARSH: Probably not, though some of the thinking may be there, but in the rigorous way. It's a topical report, so you don't have to do that in that regulatory process.

DR. KRESS: No, but it's a place where there are real criteria and real limits and cost/benefit levels that you can make judgments on. And I just wondered if you actually went to a

quantification of those things.

MR. MARSH: We did not do that. We did not.

DR. KRESS: It's a judgement call.

MR. MARSH: It's a judgment. We did ask ourselves in terms of the four performance goals, our pillars, what are the merits and demerits of these tests from the standpoint of our four performance goals? Does it increase safety? Is it an increased regulatory burden? Does it improve public confidence? We asked ourselves those questions too.

DR. KRESS: Trouble is the answer to those are qualitative.

MR. MARSH: They are qualitative. If they all aligned in a particular direction, that would guide you in a certain decision, but they don't. They don't. Some of them conflict. And from the standpoint of safety, which is fundamental, we could not disagree with the Licensee's proposal from that standpoint.

MR. ROSEN: The two tests we're talking about are the generator load reject and the main steam isolation valve closure.

MR. MARSH: Right.

MR. ROSEN: You would agree, would you

not, that those two occurrences are anticipated operational occurrences within the life of the Plant?

MR. MARSH: True. Yes, sir; they are.

MR. ROSEN: So that in fact the Plant is going to run these tests one day.

MR. MARSH: At Hatch.

MR. ROSEN: And the only difference between doing it now and doing it then is that the Licensee and the staff get to choose the time of the test, rather than letting the Plant choose the time of the test.

DR. KRESS: And you can set the boundary conditions a little better, I think.

MR. ROSEN: Yes, and the Licensee could have additional staff available, additional monitoring equipment, management awareness --

MR. MARSH: True.

MR. ROSEN: -- could assure that no other activities are going on in the Plant at the time that could distract operators from their -- so we're going to have a tests, we just don't know when it's going to be.

MR. MARSH: That's probably true. Hatch had one, and in fact that's a part of the staff's observations, that the test was not required for

Hatch, yet they had one. And the Plant performed as it was projected to perform. There weren't any surprises. So you're probably right. These are AOOs. It's not a Condition 2 or a Condition 3 or Condition 4 event, which are the big challenges to safety. The issue is do you have to mandate when it's going to occur with all the bells and whistles that go with that and to what end?

MR. SHUAIBI: To clarify that, we're not saying that Hatch did the test. Hatch had an event. They had several load rejection events. And we went back and we looked at those, and there was really nothing of significance there that would tell us, you know, that these Plants ought to do the --

DR. KRESS: What code was used to predict the results of these tests? Is that a ODYN --

MR. SHUAIBI: ODYN code, yes.

DR. KRESS: And you look at ODYN code and say, "We know the parameters in there within a certain level of confidence, and if we run this test, it won't increase that confidence enough to say that the predictions would give me better confidence." That's kind of the judgment type call you make.

MR. SHUAIBI: Well, validation of the codes is done, like we said earlier, through --

DR. KRESS: It's already done other ways --

MR. SHUAIBI: -- many, yes, other ways.

DR. KRESS: -- so that gives you a certain level of confidence.

MR. SHUAIBI: Right.

DR. KRESS: And the only reason to run these other tests is to see if the code's missing something or to improve its confidence level. And you're saying that the test just doesn't --

MR. SHUAIBI: I want to add something on this issue. I think we discussed this in detail in coming up with our conclusion here. We do not believe, although it's been stated before by others, we do not believe that theses tests are necessary for the codes, and we did not ask that these tests be done for validation of the codes. We have other ways of validating codes. And we have a draft SRP and Reg Guide on all the kinds of things that you need to do to validate codes and how you would run plants within the boundaries established on those codes and correlations, et cetera.

These tests are really component response tests to ensure that these components that you're relying on are going to respond in a way that you

expect them to. So it's not a code issue; it's a component issue. It's how you model the components when you run the codes. Are you modeling them correctly? Is the valve going to shut the way that you expect it to?

DR. KRESS: I have trouble with separating that out as not being a code issue, but I guess --

MR. SHUAIBI: Well, I guess, it's -- you know, there's the code issue of correlations and things like that, and then there is the modeling of the components that go into the decks that run the codes.

DR. KRESS: Well, I consider that's part of the code.

MR. SHUAIBI: Okay.

MR. MARSH: Jerry Wermiel is here from the Reactor Systems Branch. Jerry, do you want to add anything to that?

MR. WERMIEL: No. I thought Mohammed did a -- this is Jerry Wermiel, Chief of Reactor Systems Branch. I thought Mohammed's response was right on the mark.

MR. MARSH: Okay.

DR. WALLIS: The arguments for not doing the tests are that it challenges the Plant in some way

so there's some risk involved? Is there a risk of the equipment won't work so well the next time around because it's been through the test or something? And then there's the burden. Is that that they have to -- they don't produce power for a period of time? There's a cost? How big are these things?

MR. SHUAIBI: We didn't actually -- as we said earlier, we didn't actually go through the back fit process. First, I think it would be very hard to quantify the benefits of this test.

DR. KRESS: Yes, I don't know how you --

MR. SHUAIBI: I mean regardless of whether it's code validation or anything else. I mean you could probably get some estimates on cost, but what is -- that's the burden of this test. But what is the benefit of this test?

DR. WALLIS: No, look at the burden. I mean there is some benefit and it's in public confidence, and here's a test which would suggest -- which they propose to do, and if they had done it, they could say, "Well, we've gone out of our way to do the test, and we've got more confidence, which is good for public relations."

MR. SHUAIBI: True, true. But in doing a cost/benefit, you would need to look at both sides.

DR. WALLIS: So what's the cost to them? Is it that they don't produce power for some period of time? Is that the big thing that makes them reluctant to do the test?

MR. SHUAIBI: Well, I think in terms of burden -- and maybe they'd want to talk about this a little bit -- but what we looked at as being a burden, it's not just the fact that they're going to be down when they trip the Plant; it's they're going to be down, they're going to have additional staff that's going to be at the Plant, there's going to be a lot of evaluation of the data. You don't run the test and come right back up. We looked at all that in terms of burden, but that's only one aspect of it. I mean I'm not here to say that because of burden we're not doing these tests.

There's a lot of stuff that we looked at that's convinced us that these tests are not necessary. We looked at the equipment and how that's going to be affected by the power uprate. We looked at -- and that's what we looked at to convince ourselves that it's not necessary. And then we also looked at the burden, and we also looked at the risk associated with it.

I mean the risk argument is -- it's kind

of -- it's pretty balanced on the risk side, because you could say that there's risk associated with it, but you can't come up with a definitive number that says, "But here's the benefit from it," so that you could compare it to. I mean it's really qualitative in that. So you have a number on the risk associated with it, nothing on the benefit.

So I think what we're here to say is we looked at the components and how they are affected by the power uprate.

DR. KRESS: Have these tests been run at these Plants at the previous power level?

MR. MARSH: I believe they have. I mean I believe that's part of the start-up testing program. Please refute that if that's wrong, but I believe that's part of the start-up testing program, the initial start-up testing program.

DR. KRESS: So you have the equivalent of these tests at the old power level.

MR. KLAPPROTH: We do have tests, and we do have transients. I believe within the last two years we've had one of each of these at Dresden and Quad units.

DR. KRESS: So you do have a lot of information.

MR. KLAPPROTH: We do have a lot of information at the current power level.

DR. KRESS: And so all you're doing is extrapolating to a new power level.

MR. KLAPPROTH: Right.

MR. MARSH: It leaves you with a question, though, and the question -- one of the questions, what is the original purpose of the test? I think we've answered that. But it leaves you with the question of, well, I've increased power by about 20 percent. Suppose they increase the power by 30 percent or 40 percent? At what point would the staff say, "You know that's enough of a challenge to a system or enough questions about the code or enough issues about plant modifications that I want to run the test." It leaves us with that question that's not answered.

DR. BONACA: Well, that's exactly why I was going back to the original tests. They were not done superficially, okay? They were plants. I remember the detail. There were justifications, specific reasons why you're running the test. And I just am surprised that that information hasn't been developed to justify why it's not being right now if the information is available. Now, clearly, it's a long time since the last plant was started up, and

maybe information has been lost, I don't know. But something -- I mean that would have kept us from being here for a long time discussing it among ourselves what may be in the mind of the people who recommend that we don't perform the test.

MR. MARSH: I agree.

MR. ROSEN: Specifically, with respect to the main steam isolation valve test, the steam flow rates through those lines will be 20 percent higher.

MR. MARSH: Right.

MR. ROSEN: So those valves will never have closed against that much more steam flow. Now, my recollection of those valves is that they are assisted by flow. The closure is assisted by the flow. So more flow may actually be better.

MR. MARSH: You still have a restriction of timing.

MR. ROSEN: Right. You can't go too fast, and you can't go too slow.

MR. MARSH: It can't be less than three; it can't be more than five, right.

MR. ROSEN: But it is a complex system, that valve, and it's a huge valve which may be assisted by increased flow in terms of its closing, but it may be assisted too much in the sense it may

close too quickly.

DR. KRESS: What's the downside of closing too quickly? Are you getting water --

MR. MARSH: Too fast of a transient on the reactor.

DR. KRESS: Too fast.

MR. MARSH: Too much of a power feedback into the reactor. The pressure increases too fast, and it causes too much fuel feedback. But they're testing the MSIVs.

MR. SHUAIBI: They do MSIV testing in accordance with the tech spec surveillance requirements. Now, they're not testing the MSIVs with 20 percent additional flow.

MR. ROSEN: But the point is that -- that was exactly the point.

MR. SHUAIBI: Yes. But they do test the MSIVs. It's part of the IST Program. They test MSIVs, and they have limits on both sides in the tech specs. They have a limit for how fast they can close and how slow they would close. And looking at that from -- you know, there's a three-second limit and a five-second limit. On the five-second limit, these valves are supposed to shut against steam line breaks and areas which remain the same for this case. On the

other side, we looked at what exists today to require the Plant to go back and do testing to make sure that it will close. There's not a 20 percent additional flow test that release from 100 percent power.

DR. WALLIS: I wonder if it's time to move on to the other question.

MR. MARSH: Yes. Can we do that? Move on to the other -- the recirc runback test? Okay. Stewart?

MR. BAILEY: Okay. This is Stewart Bailey. I'm the Project Manager for Quad Cities, and as you requested, I will give you a brief overview of the recirc runback system and the testing that the Licensee has proposed to do that. First, to make sure that we're on the same page, the recirc runback system that the Licensee is adding is really for trip avoidance only. That is its function.

Currently, the Licensee, in operating the feedwater system, runs three of four condensate pumps and two of three feedwater pumps. As a result, they have installed spare of each pump. The way their system operates right now is if one of these pumps should fail for any reason, there is an auto-stop at the standby pump, and that will recover the feedwater flow and prevent the reactor scram, okay?

If you look at the way the Plant will be operating following EPU, when they're greater than the current power level, they need to run these installed spare pumps. They'll be running four out of four condensate, three out of three feedwater pumps. And, therefore, they've lost the ability to auto-start an installed spare to prevent the scram. What the Licensee has done is they've added a recirc runback system that will recover, essentially, some of the ability that they're losing to prevent that scram.

Basically, what they're doing, I think we know some of the details of it, is the flow will be reduced to about 70 percent. And if you look at the flow control line, that corresponds to roughly the current full power level. So the runback system brings them back into the -- basically, back into their current operating conditions and allows the feedwater system to recover reactor vessel level.

The system that they put in place is very similar to the runback system that's used at other plants. I believe it's very similar to the system that's been into -- that's already in service at Peach Bottom. There is some additional logic to it, because it's only required at high steam flow rates, when you're at the point where you cannot install -- just

rely on the installed spare or rely on the reduced number of pumps.

Now, the Licensee has proposed and is going to be conducting a significant amount of testing on the recirc runback system, okay? This testing is being done essentially in accordance with their post-modification testing procedures. On the feedwater system, they're doing a number of instrument calibrations, they're taking a look at the logic for the staggered pump trips, they'll be tuning the level control. They have a series of tests where they adjust feedwater position and/or reactor vessel water level input and check for the stability of the feedwater system. And they'll be doing tests on the feed reg valve position changes and what not.

On the recirc system that they're installing, they will be doing tests on its circuitry and its alarms. They have calibrations of the recirc pump runback speed limiters of the scoop tube final position, and they will be doing full logic functional tests on that. A series of overlapping tests so that there is some overlap between the systems that are being tested, and this gives them the confidence that this system will perform as intended.

The Licensee does not intend to conduct an

integral test of the system. They do not intend to, for example, trip a pump and exercise the runback system and see whether or not it actually avoids scram.

MR. ROSEN: But you'd agree that the Plant will conduct that test some day.

MR. BAILEY: I think it's highly probable that they will lose one of their condensator feedwater pumps, and the system --

MR. ROSEN: And the runback system will come into play.

MR. BAILEY: That is correct. Whether I would characterize it as a test, I might stop short of that, but, yes, I think they will exercising this feature.

MR. MARSH: I agree.

MR. BAILEY: When the staff took a look at this and the need for the testing, as you mentioned, the fact that this is a new system would lend some weight to the Licensee performing an integrated test of this. Similar to the logic we used for not doing the large transient testing where they haven't done significant new mods or trips, here they have done what could be considered a significant mod and added logic into it, okay?

But the staff's fundamental consideration when looking at this is that the recirc runback does not perform a safety function, okay? The recirc runback is really there for trip avoidance only, to recover some of the ability that the plant used to have in responding to a loss of a pump in the feedwater system.

MR. ROSEN: But you'd agree that preventing initiating events, for example, a reactor scram, is a worthy goal.

MR. BAILEY: I believe that it is a worthy goal. The staff has considered, though, that they can approve the extended power uprate without this feature installed, okay? The licensing topical report, ELTR1, acknowledges the fact that some plants will be running their installed spares, and therefore they will no longer have this capability.

MR. ROSEN: So the staff would be willing to accept --

MR. BAILEY: That's correct.

MR. ROSEN: -- without the recirc runback system and let the Plant trip for a condensate pump or a feedwater pump.

MR. BAILEY: That is correct. And when we were looking at the risk evaluations associated with

the power uprate, the Licensee did not credit this feature. The increase in scram initiation off the feedwater transient just looked at the additional probability of failing these pumps, and we didn't credit any recovery from the recirc runback.

So these are some of the considerations. In additional ELTR1 didn't require an integral test of the runback system on plants that already have it, okay? So these are decisions that have been made by the staff, and due to the limitations on what this system actually does, the result, if this system should fail to perform its function, is that you get a reactor trip, and you end up in a stable condition.

MR. ROSEN: ELTR1 is a GE document.

MR. BAILEY: ELTR1 is a GE document, yes.

MR. ROSEN: It's not a staff document. We're getting a little confused here by saying ELTR1 doesn't require, as if it were some sort of regulatory requirement. It isn't; it's simply a GE document.

MR. BAILEY: The staff has approved ELTR1.

MR. MARSH: You're right, though. It's not a regulatory document; it's a proposal which the staff has accepted.

MR. ROSEN: Right.

MR. BAILEY: Okay. So I guess the bottom

line is since this does not perform a safety function, does not prevent anything from reaching any safety limits, okay, that was one of the staff's primary considerations in whether or not a test of the system would be needed. In contrast --

MR. ROSEN: And here again you're using the word "requirement" in this final slide -- there is no requirement for an integral test.

MR. BAILEY: Correct.

MR. ROSEN: One could read that with a bold heading, "NRC Staff Conclusions." I can almost read like there is no regulatory requirement. Really, I think what you're saying is you don't feel that on balance it's needed.

MR. MARSH: Exactly.

MR. BAILEY: I don't think it's needed on balance. I think there are several people who believe it would be prudent to run this test to verify. What they have done is they've run the ODYN codes to predict reactor vessel water level and to see whether or not they've lowered the reactor vessel water level sufficiently to prevent the scram, or whether the runback goes back sufficiently to prevent the scram. Running this test, of course, would verify that, and it would give them information that they could use to

tune their feedwater system response, tune the recirc runback system or perhaps initiate a further reduction in reactor vessel water level. But I think it stops at the level of prudence, and as you've noted, the probability is high that they will be exercising this system sometime in the future.

MR. MARSH: Okay. Mr. Chairman, that completes our presentation on these testing issues. I hope you've gotten a sense of the staff trying to weigh the pros and the cons for each of these, and there are pros and cons associated with each of these tests. And we've constructed for you, I believe, our bases for coming to where we are. So thank you very much.

DR. WALLIS: Does this change the SER? Are we going to get a final SER?

MR. MARSH: Yes. You will be getting a final safety evaluation for the large transient tests. I believe that's true for the recirc runback tests or is it --

MR. BAILEY: No, the recirc runback tests we did not go into detail, because it did not perform a safety function.

MR. MARSH: Okay.

DR. BONACA: That's right. Same

difference there.

DR. WALLIS: So we're going to be asked to make an evaluation without seeing this final SER version of the --

MR. MARSH: You will certainly see the large transient test safety evaluation change. It's a new section.

DR. WALLIS: When will we see it?

MR. MARSH: We're ready. I thought that was already here. Did we not send that to you yet?

DR. WALLIS: No.

MR. MARSH: Okay. It will be here today.

MR. ROSEN: And it discusses the recirc runback as well?

MR. BAILEY: No, it doesn't, because there is not the safety function associated with the recirc runback system.

MR. ROSEN: So we will get not further information than that on the whole question of recirc runback, will we? The information we have is what you've provided today.

MR. MARSH: Right. Right. Exactly. We'll get you the safety evaluation for the large transient.

DR. WALLIS: Are there any other changes

to the SER?

MR. MARSH: I don't believe so. Singh, any changes to the safety evaluation? Okay. I don't believe so.

MR. ROSSBACH: Larry Rossbach, Project Manager. We have resolved a number of small or open items that were in the report, and we've done a lot of editing in response to your comments on the Dwayne Arnold report. So, yes, there are a number of changes.

MR. MARSH: But wasn't that set down before, Larry? Wasn't that before the last full Committee report?

MR. ROSSBACH: No, it wasn't.

MR. MARSH: Okay.

MR. ROSSBACH: Just the original draft.

MR. MARSH: Okay.

DR. WALLIS: So we may be being asked to write a letter without seeing the final SER. If there have been changes as a result of our previous comments on Dwayne Arnold, then they might be significant.

MR. MARSH: Okay. Singh, do you want to say something?

MR. BAJWA: No. I was just going to say that the final safety evaluation becomes final when it

is issued, so the only way we can provide you is once we actually issue the document.

MR. MARSH: How can we help? We'll give you the draft updated, the latest draft that we have?

DR. WALLIS: I think that would be useful.

MR. MARSH: Okay. We can do that. Which includes the large transient parts too, the large transient sections?

DR. POWERS: I'll remind you that our Senior Fellow has given us a comparison of before and after.

MR. MARSH: Okay.

DR. BONACA: Okay. Any further --

DR. WALLIS: Any further questions for the staff at this time? Let's move on then.

MR. MARSH: Thank you.

DR. WALLIS: Thank you very much. We're ready when you are.

MR. NOSKO: Thank you very much, Mr. Chairman, and once again, thank you for allowing us to come to the Committee.

We have been asked to provide a statement of concurrence with the staff review. My name is John Nosko. I'm the Project Manager for the Extended Power Uprate project for Exelon Nuclear. And I am here to

do that.

Specifically, first, for the subject of large transient testing, we, of course, do concur with the presentation, as you heard from the staff. I believe we've clearly laid out our position in previous submittals. I would, however, like to make sure that we clear up the apparent misunderstanding that was laying there on the table about the no new information. We did provide a letter the 18th of May on this very subject, and we did note in there that it was our conclusion that conducting large transient tests will not provide significant new information regarding transient modeling or the performance of Plant components. And I would like to make sure that -- I don't believe we have gone through the absolute of saying "no new information," so just to clarify this.

And as a final point of note, that last bullet on this slide, of course, we would, with any flat transient, we will be collecting data if and when any of these transient events occur at the Stations, and we will be making a very thorough and careful evaluation of those results against the predicted Plant performances. So, yes our conclusion to the Committee members is that large transient tests are

not warranted.

MR. HAEGER: This is Al Haeger. There was some question on the burdens, Dr. Wallis. The primary burden is the thermal cycle on the Plant and its components, and some of our components are sensitive to that and require -- may require repair after that. And so inducing two of these transients within a short time, of course, would be an extra cost. And a secondary cost, of course, is the down time, which is about two days for each of them.

MR. NOSKO: Okay. Moving on then to the recirc runback test and the should we or should we not trip a feed pump as part of a performance test for that new operating feature, I believe Mr. Bailey summarized it very well, that the modification has been designed to provide us with operating margin only, help us ride out a low-level scram. We believe that the scope of our plan testing does provide adequate demonstration of the capability of this modification to perform its intended function. And our conclusion is, as the staff has concluded, that the feed pump trip at power is not warranted.

And with that, the Committee also had, I believe, three additional questions that they would like Exelon to address, and we will be bringing people

forward to answer those three questions at this point in time. The first speaker will be Dr. Jens Andersen from Global Nuclear Fuels.

MR. HAEGER: Let me summarize the question, as I understand -- as we understood it from last time. It's regarding fuel energy deposition limits and it was to justify the use of the 170 calorie per gram energy deposition limit that was used for determining that the potential instability during an ATWS event was acceptable in the light of the data that some of the members, or one of the members had seen regarding fuel failures at different exposures.

We have provided these in writing. I would hope that you had seen those answers in writing. Is that correct?

MR. SIEBER: Yes.

MR. HAEGER: Did you get those?

MR. SIEBER: Yes.

MR. HAEGER: Okay. Thank you.

DR. POWERS: I certainly have not seen them, but I've been off in Europe looking at high burn-up fuel assemblies getting exposed to power insertions and blowing apart.

DR. ANDERSEN: This is Jens Andersen from Global Nuclear Fuel. Al Haeger just reiterated the

question, and the issue that for the EPU we really -- we are not extending the burn-up limits. The burn-up limits are the same as they have always been. We are not increasing the duty on the fuel and really no new phenomena introduced.

What we have seen in previous analysis for the -- typically, when we looked at the ATWS instabilities and the duties that could be imposed on the fuel, we have seen enthalpy energy depositions in the fuel that are significantly lower than the current limit. As discussed in the report, NEDO-32047, that was submitted a long time ago on the ATWS instabilities, what we saw was maximum energy depositions that was in the range of about 30 to 80 calories per gram. Eighty calories per gram was typically off fresh fuel, high-power bundles. Highly exposed fuel out in its third cycle were down in the 30 calories per gram. That is significantly below the current failure limit.

DR. POWERS: Well, what -- I mean you keep saying "current failure limit." The current failure limit, I think, for BWR fuel is like 170 calories per gram. And I haven't seen a fuel assembly -- or fuel rod survive 170 calories per gram for burn-ups above 25, 30 gigawatt days for ton. I mean it's just not a

meaningful limit anymore. I mean you're telling me something that's of no impact whatsoever.

MR. HAEGER: Well, we need to finish the answer to the question, okay?

DR. ANDERSEN: What we are seeing is that -- clearly, the point I'm making is that we are not extending the burn-up limit as part of the EPRI analysis. And the Robust Fuel Working Group, they're looking at what the burn-up limit should be. And I understand that they may want to change those burn-up limits for high-exposure fuel.

What we are seeing is that the energy depositions we are getting for fresh fuel in the order of 70 to 80 calories per gram, which is less than half of the current failure limit. And I believe it's less than what EPRI is thinking about reducing the failure limit to for high-exposure fuel. For high-exposure fuel, what we typically see are energy depositions that are in the order of 30 calories per gram, which is about a factor of five less than the current failure limit.

DR. POWERS: Now compare it to where fuel rods are failing in reactivity insertion events.

DR. ANDERSEN: What our accidents for activity insertion events are, we did an extensive

analysis of that following the complete event. And what we do is with the rod bank withdrawal sequence we are limited to the maximum rod thrust of less than one percent delta K over K. For a rod drop accident of one percent delta K over K for fresh fuel, we get roughly 70 calories per gram. Forty gigawatt days per ton, we are down in the order of 25 to 30 calories per gram.

Again, high-exposure fuel, the energy deposition is almost an order of magnitude less than the current failure limits. Therefore, we believe that there is no safety issue, even in light of the fact that if we're considering to lowering the current failure limits.

DR. POWERS: Well, since you're not going to quote the levels at which fuel rods are coming apart, maybe I'll just quote some numbers to compare against. We have fuel rods disassembling at 80 calories per gram, 50 calories per gram and one remarkable rod at, depending on how you count, either 36 or 18 calories per gram. I mean to say -- quoting against this 170 calories per gram is of historical interest only.

DR. ANDERSEN: Yes, I understand that. And I also understand that that particular test -- I

presume that you are referring to the CABRI test -- is really not representative of BWR and the way BWR fuels operate and the power that BWR fuel could be exposed to.

DR. POWERS: I think that's a very fair statement, because, admittedly, a PWR rod, what not, and, quite frankly, I'm not absolute positive any BWR rods have been tested, which itself says something.

MR. HAEGER: Well, our point, in conclusion, is simply that adoption of more restrictive limits for an EPU, in which no other effects are changing, is not warranted at this time.

DR. POWERS: I think what you're saying -- and I think I agree with you -- is that right now you're in compliance with what the staff's required. It's just not an issue here.

MR. HAEGER: And we do feel that it's low potential safety significance based on the data that we have. We understand --

DR. POWERS: Well, I don't know about that one. That's kind of -- that one I think we could argue over, maybe over a beer sometime. The next statement that you make is there's no -- the EPU puts no additional load on the fuel. That's one that's a bit of a mystery to me. Could you explain that a

little more? Why isn't there a 20 percent more load on the fuel here?

DR. ANDERSEN: The peak power level of the fuel doesn't really change.

DR. POWERS: Change.

DR. ANDERSEN: The rod lines -- the maximum rod line does not change. So peak power of the fuel is really the dominant effect of --

DR. POWERS: That's what you're saying.

DR. ANDERSEN: -- what controls the load.

DR. POWERS: It definitely puts more load on the fuel, but it's not changing the peaks is what you're saying.

DR. ANDERSEN: Right.

DR. KRESS: Unless the instability magnitudes change because of increased burn-up.

MR. HAEGER: Yes, and we discussed that last time, and I believe --

DR. KRESS: And they did change some, but best I remember, they --

MR. HAEGER: I believe that GE last time presented a sensitivity study that said that the generic ATWS analysis applied -- it looked like it applied to the EPU condition, in fact, the MELLA Plus, in fact, testing that they've been doing.

DR. KRESS: Yes. Okay. So you get the same sort of --

MR. HAEGER: That's correct.

DR. ANDERSEN: The rod line doesn't change.

DR. KRESS: Yes.

MR. HAEGER: Okay. We'll go on then. We have the next group of two questions Keith Moser is going to respond to. Keith is our Reactor Internals Program Manager for Exelon. As I understand, the second question was referring to the dryer lug attachment inspection frequency, and we came back with that last time but really didn't address the significance of that frequency. Keith is here to do that first.

MR. MOSER: Yes. First of all, what I want to do is say we just got out of the Dresden 2 outage, we went back and we looked at the dryer before we installed the mod, and then we went and looked at the lugs. And then after we got the mod done, put the dryer back in, we looked at all the four set points to make sure we had contact.

Now, after 32 years, these were holding up really well. We saw no degradation. So with that and the fact that when we did the modeling and the

endurance limit was 10,000 psi, code limit of 13,600 psi, so you already have like a 36 -- I'm sorry -- yes, 36 percent safety factor inherent in that, and we met the 10,000 psi endurance limit.

We have a pretty good basis for saying that the ten-year interval established by Section 11 is appropriate. But because we know that there's BWR-4s, BWR-6s that have this problem, we've made the determination that after one cycle we're going to go back and take another look for all four units and make sure that we don't have a problem and then we'll go back and reassess if the ten-year interval is an appropriate length for us to go. Does that answer your question?

DR. FORD: Yes. The reason for the whole topic to start with was that during one of the presentations that were made you said that there would be an increased vibratory stress transferred to the lug, which originally made we think of the fact that the failure mode is not necessarily fatigue on which the core is based, just stress corrosion cracking of the lug. And it is generally the incidence of stress corrosion cracking will increase with a small vibration load regardless of fatigue as being the phenomena of failure.

And I wondered how your inspection periodicity might be changed because of that particular phenomena, that is stress corrosion cracking accelerated by a small superimposed and increased vibration load? And that was the physical origin of the question. The fact that you are going to maintain your inspection periodicities, as I understand it from your reply, less than ten years, it should mitigate that problem.

MR. MOSER: I believe it will. Also, I talked to Sam Ranganath about this and Dave Randall, and in these cases, for the BWR-4 and BWR-6, it was fatigue.

DR. FORD: Okay. It was transgranulas?

MR. MOSER: Well, they didn't take a vote sample, per se, but it was classic. It may have had a small starter point with IGSCC, but it's pretty clear that it was fatigue in this case.

MR. HAEGER: The final question was on flow accelerated corrosion. We had a predictive model that showed an increase in wear rate in some portions of the feedwater system, from a projected 19 mils per year to 21 mils per year. And we didn't have at our fingertips what the thickness of the pipe was at that time and then some replacement frequency information,

so we've provided that here.

MR. MOSER: Yes. And once again, we're talking about some fairly significant pipe -- 120 for the schedule, 18-inch diameter and 24-inch diameter. And what we're looking at with the CHECWORKS model, we're looking at a place where 2010 is where we're saying we think we may want to be thinking about replacement, not necessarily replacing. But we're going to inspect in 2008.

Now, prior to the EPU, we were saying we could go all the way out to 2010 and then thinking about replacing in 2012, but, you know, we're talking about something that's fairly thick, fairly significant. The projected wear rates are actually overestimated, if you will, and we feel like we're very conservative in this manner.

MR. HAEGER: We should emphasize these are localized components. These are things like reducers or elbows, not entire pipe sections, obviously.

MR. MOSER: Actually, the component was --

DR. POWERS: Actually a hole in any part of the pipe is a hole.

MR. MOSER: Well, yes, but we --

DR. POWERS: It doesn't matter whether it's local or --

MR. MOSER: We thought you may be envisioning entire pipe replacements or something, I guess.

MR. HAEGER: And the component that was most susceptible was the concentric reducer.

DR. WALLIS: What are the actual wear rates? You have had inspections of those components.

MR. MOSER: Yes. They're --

MR. HAEGER: Thirteen to 16. I think the pre-EPU actual rate was 13.

DR. WALLIS: So they're comparable but lower.

MR. HAEGER: Yes. Right.

MR. MOSER: And then the thing you have to do with -- we have two inspection data points and with CHECWORKS you want to do the predictive module rather than just count on two data points. So we're being somewhat conservative. Any other questions?

MR. HAEGER: Okay. Well, again, we want to thank the Committee for allowing us to come back, and we'll look forward to your deliberations. Thank you.

DR. WALLIS: Are there any other questions for the staff or Exelon or GE?

DR. POWERS: Well, let me ask a question.

The answer may be it's covered by a different part. And that is we're going into a combination of power uprate and inevitably using our fuel to hire burn-ups, and we have a concern in this power uprate about the possibility of getting into an oscillatory regime. And we have a process -- a procedure for recovering should we ever get into that oscillatory regime that is -- it's not trivial.

I mean it does involve dropping the level of water, injecting some boron and bringing the water up. Do we understand what kinds of stresses, lateral stresses that puts the fuel under, and are we confident that that fuel survives those lateral stresses?

MR. HAEGER: Dr. Andersen, I don't know if you can help with that. That's something I wouldn't be prepared to discuss.

DR. ANDERSEN: I'm not prepared to discuss the stresses on the fuel.

MR. HAEGER: I guess the only response we can give is that the ATWS instability study that -- and help me out if this is not right -- but that study was a generic study that since GE has confirmed that they believe applies to power uprate. Now, I don't know if that covers lateral stresses on the fuel or

not.

DR. ANDERSEN: What the study showed was, as I discussed earlier, that the energy depositions that you had in the fuel was substantially lower than what the current failure limits are. As I said earlier, the energy depositions, the max energy deposition we saw on fresh fuel was in the order of 70 to 80 calories per gram. For highly-exposed fuel, it was down in more like 25 to 30 calories per gram.

What we did see that in the absence of an mitigating event, that you could get translations on the fuel and some fuel failures on a very small fraction of the fuel in the core. Those failures were oxidation failures, not stress failures.

DR. POWERS: Let me ask a question about that and power input. Originally, you quoted power inputs for a rod bank withdrawal. In the oscillation, we're talking about a little bit different; that is, a series of cycles that each -- which is putting power into the fuel. Seems to me that the power and input then depends on the number of oscillatory cycles you go through.

DR. ANDERSEN: That is correct, but if you look at the net energy deposition in the fuel, that is equal to zero, because the heat removal rate to the

coolant is equal to the energy deposition into the fuel.

DR. POWERS: Oh, yes? Temperature doesn't go up at all?

DR. ANDERSEN: If you fail to relieve it, then the temperature goes up, and that's correct. It will go up and you will get a failure in a small fraction of the fuel. If you look at the old report, the NEDO-32047, we showed that that could happen to a small fraction of the fuel that had the highest power oscillations. When we analyzed how large a fraction of the fuel that could be exposed to that failure mechanism, it was less than half a percent of the fuel. And that was deemed acceptable at that point.

DR. POWERS: And if we use a lower failure criteria, what does that percentage go up?

DR. ANDERSEN: The failure rate was really not associated with the energy deposition. The failure rate was associated with the fuel during the periodic oscillation exceeding the minimum fuel burning temperature and failing to relieve it. And then the failure was really an oxidation failure at high temperature. So it was really not associated with the energy deposition.

DR. POWERS: And I don't know if it's

appropriate in response to your question to comment on operator mitigation, but, certainly, that's a consideration.

MR. HAEGER: Yes. That's a question that we continue to wrestle with. And I never know how to come down on this. I mean you test the operators with the current configuration in the Plant, and they do very well.

DR. POWERS: That's right.

MR. HAEGER: And so now we're going to say that the higher power, where they have a little less time, they'll still be able to do very well.

MR. HAEGER: Tim, do you want to comment on that?

MR. HANLEY: My name is Tim Hanley from Quad Cities. The way we test and train the operators really is that they can initiate it based on the parameters they're monitoring, not a specific time period. So their reaction to the ATWS event in a uprated core versus a non-uprated core is not significantly going to change, because it's based on parameters that they're monitoring, not specific time criteria.

DR. BONACA: I mean I understand what you're saying, but if the parameter reaches a certain

point at which he has to take action in ten seconds, right, it would make a difference --

MR. HANLEY: It certainly would if it was making changes in that time period, but we're talking on the order of minutes, not in the order of seconds here.

DR. BONACA: But this argument has been made many times that way. I think there is still a sensitivity to the timing.

MR. HANLEY: Well, certainly, certainly. If it was changing it to a matter of seconds or from ten seconds to five seconds, that would make a difference, but we're talking in the order of minutes where the operators have an opportunity to assess the situation, monitor the parameters and take the correct actions.

DR. WALLIS: These extreme oscillations that you gathered in ATWS, your understanding of that is based on codes and theory or are there some sort of experiments?

DR. POWERS: Well, a couple of events. A full-scale event at La Salle.

DR. WALLIS: Okay. So does that give confidence that you really understand what would happen with these power uprates with the ATWS

oscillations?

MR. HAEGER: Again, we have covered this in the past, but Dr. Andersen?

DR. ANDERSEN: Well, these are complicated coupled thermal-hydraulic neutronics oscillations. We do have full-scale reactor test data for thermal-hydraulic coupled neutronics oscillations. We also have some unplanned event. We have full-scale testing that has been conducted on several European plants.

Particular tests were conducted at the Leibstadt, the KKL Plant. We also have the event that happened in 1988 at La Salle. We have used those events to qualify our codes, and we actually predict those events very well.

DR. WALLIS: Anything else? Then I would thank you very much. And I will hand the meeting back to the Chairman.

DR. APOSTOLAKIS: Thank you, Dr. Wallis. We're 11 minutes early. Very good.

DR. WALLIS: Well, with thermal-hydraulics things go quickly.

DR. APOSTOLAKIS: They go very quickly, yes.

(Laughter.)

DR. POWERS: Because a momentum equation

doesn't come up.

DR. APOSTOLAKIS: Okay. We'll recess until 10:30.

(Whereupon, at 9:58 a.m., the ACRS Advisory Committee Meeting was recessed until 10:30 a.m.)

CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission in the matter of:

Name of Proceeding: ACRS 488th Meeting
Morning Session

Docket Number: (Not Applicable)

Location: Rockville, Maryland

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and, thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

Rebecca Davis

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